CLAIMS

Therefore, at least the following is claimed:

1. A method of cleaning a substrate, comprising:

exposing at least a portion of the substrate to a gas-expanded liquid; and

removing a photoresist layer from the exposed portion of the substrate.

2. The method of claim 1, wherein the gas-expanded liquid includes a gas and a liquid.

3. The method of claim 2, wherein the gas includes carbon dioxide.

4. The method of claim 2, wherein the liquid is selected from alcohols, ketones, organic acids, alkanes, and alkenes.

5. The method of claim 2, further comprising:

moving the substrate into a container in a cleaning apparatus, wherein the container includes the liquid; and

increasing the pressure of the gas in the cleaning apparatus to produce the gas-expanded liquid.

6. The method of claim 5, wherein the gas is carbon dioxide and the liquid is an alcohol.

7. The method of claim 2, further comprising:

submerging the substrate in the gas-expanded liquid.

8. The method of claim 7, further comprising:

introducing the gas-expanded liquid into a container; and

moving the substrate into the container so that the substrate is substantially submerged in the gas-expanded liquid.

9. The method of claim 8, wherein the gas is carbon dioxide and the liquid is ethanol.

10. The method of claim 2, further comprising:

flowing the gas-expanded liquid onto the substrate.

11. The method of claim 10, further comprising:

disposing at least one flow nozzle substantially above the substrate; and

flowing the gas-expanded liquid through the nozzle, wherein the gas-expanded liquid contacts the substrate.

12. The method of claim 11, wherein the gas is carbon dioxide and the liquid is n-methyl pyrrolidone.

13. The method of claim 2, further comprising:

spraying the gas-expanded liquid onto the substrate.

14. The method of claim 13, further comprising:

disposing the substrate adjacent to at least one spray nozzle; and

spraying the gas-expanded liquid through the spray nozzle onto the substrate.

15. The method of claim 14, wherein the gas is carbon dioxide.

16. A photoresist cleaning system, comprising:

a gas-expanded liquid system comprising a gas and a liquid, wherein the gas-expanded liquid system is adapted to generate a gas-expanded liquid; and

a substrate handling system adapted to position a substrate so that the gas-expanded liquid contacts the substrate to remove a photoresist layer from the substrate.

17. The photoresist cleaning system of claim 16, further comprising:

a computer control system configured to control the gas-expanded liquid system and the substrate handling system.

18. The photoresist cleaning system of claim 16, wherein the gas-expanded liquid system includes a container to hold the gas-expanded liquid and wherein the substrate handling system is adapted to position the substrate within the container.

19. A substrate cleaned by the following method, comprising:

exposing at least a portion of the substrate to a gas-expanded liquid; and

removing a photoresist layer from the exposed portion of the substrate.